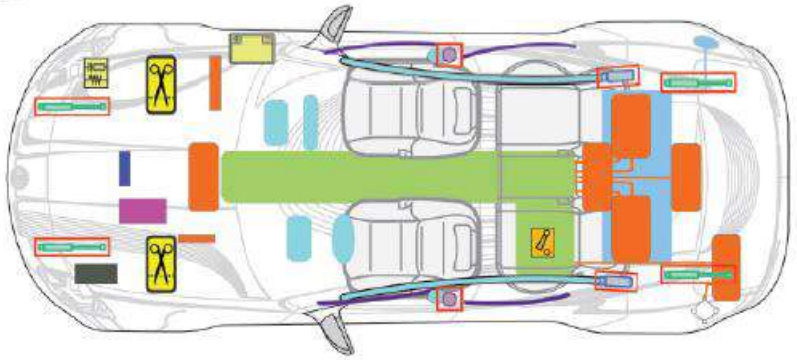
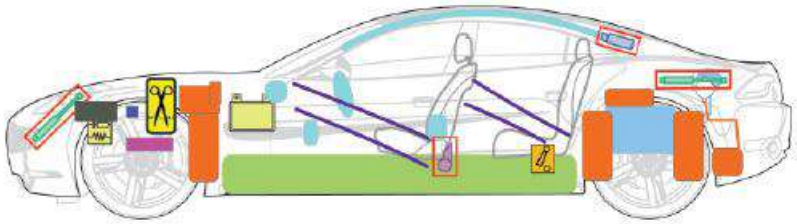
FISKER AUTOMOTIVE, INC.

High Voltage Safety
And First Response Info Guide

available on Fiskerautomotive.com and upon demand through a toll-free call to (855) 575-7577 for all First Responders





	Low voltage disable cut points		High voltage components		High voltage disconnection point
	Airbag		Structural reinforcements		Hybrid control unit
	Gas generator		Gas filled spring device		12 volt battery
	Seatbelt tensioner		Fuel tank		High voltage battery
	HV charging connector		PTC		Power distribution box
	A/C				

WARNING!

High voltage system with DC voltage up to 400V. Do not touch high voltage components. These items can be identified by the orange cables connected to them.

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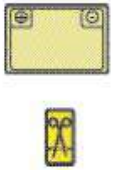
Emergency Rescue Card
Fisker Karma 2012

Distinguishing Features:

- KARMA nameplate on tailgate.
- EVer nameplate on side of vehicle.



NOTES:

Airbags triggered in an accident involving high-voltage equipment are energised.

- Turn off the vehicle using the Stop/Start button.
- 12 volt battery: Disconnect negative cable by cutting at the label (in accidents with non-deployed airbags).

Manual Door Opening (Child Emergency Escape)

In the event of a power failure, each of the doors can be manually opened from inside the vehicle by pulling the release cable located below the door handle.

To access the release cable, press the lower edge of the cover below the door handle and remove the cover.

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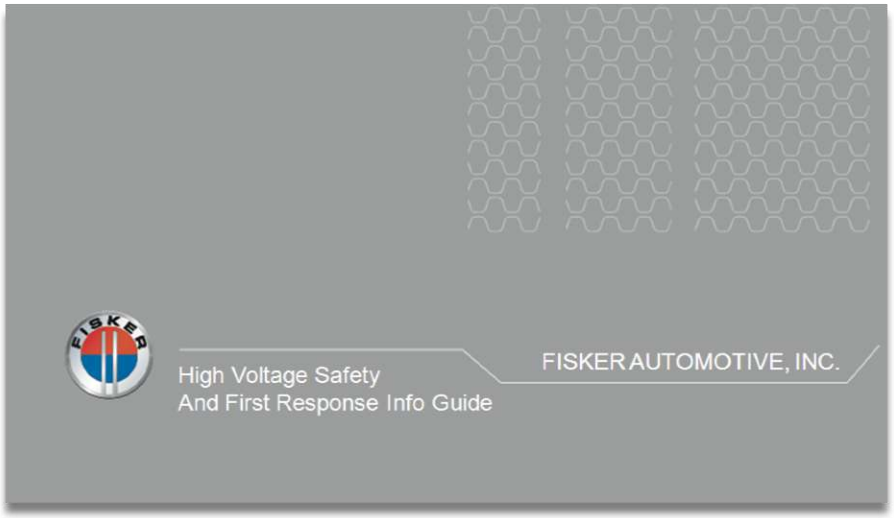
First Responders Guide



Covers:

- *Safety Overview*
- *High-Voltage Electrical Disconnect Features*
- *Other High-Voltage Electrical Components*
- *Low Voltage Battery*
- *Safety Equipment*

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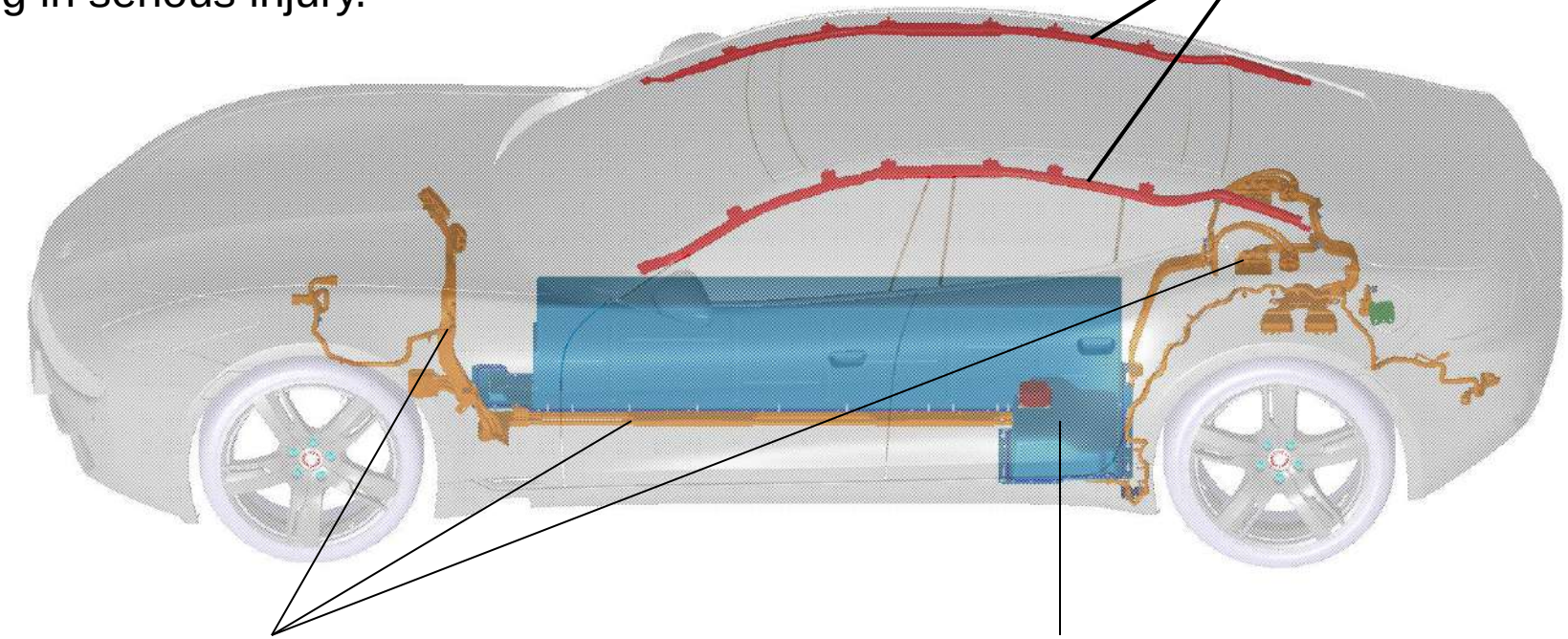
WARNING: DO NOT cut into the vehicle until the 12v electrical system has been deactivated. Cutting into the vehicle prior to disconnecting and isolating the 12v electrical energy sources may cause air bag deployment resulting in serious injury.

DO NOT CUT HERE.
Side curtain air bags.



DO NOT CUT HERE.
Under vehicle area front and rear of tunnel and through tunnel contains high voltage 400 volt electrical cables.

DO NOT CUT HERE.
High voltage battery has 400 volt electrical potential at all times.

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Welcome to the Fisker High-Voltage Safety Course

The Fisker High-Voltage Safety Course covers general safety around High-Voltage systems, what to do in case of an emergency, First Aid, and best practices when servicing the vehicle.

Table Of Contents

This course contains 6 chapters identified below:

- *Introduction*
- *Safety*
- *General Cautions & Warnings*
- *In Case Of An Emergency Situation*
- *First Aid*
- *Servicing*

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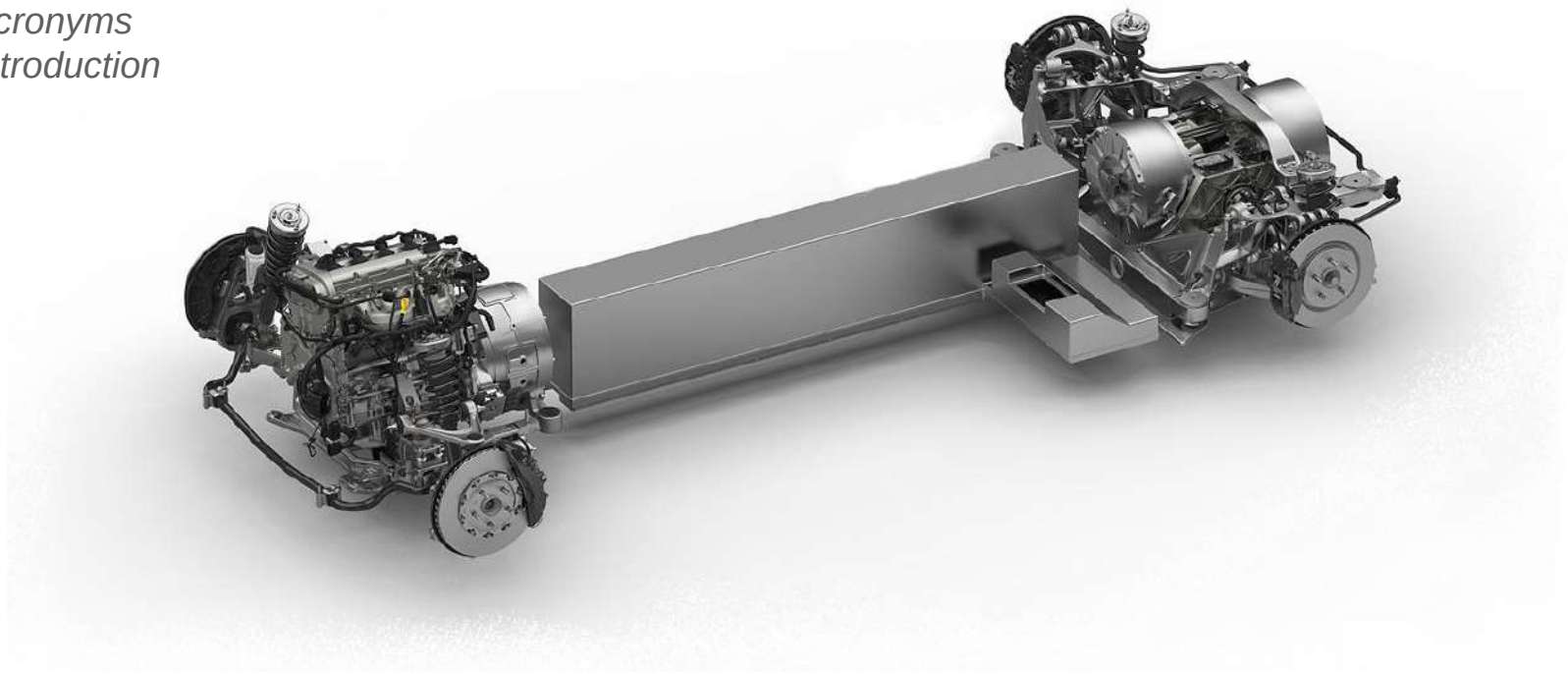
INTRODUCTION

This chapter will cover:

- *Acronyms*
- *Introduction*



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Acronyms

- *AC – Alternating Current*
- *AGM – Absorbent Glass Mat (12v Battery)*
- *APM- Accessory Power Module*
- *DC – Direct Current*
- *DIS – Driver Information System / Cluster*
- *ESS – Energy Storage System*
- *EVer – Electric Vehicle extended range*
- *HV – High Voltage*
- *HVIL – High Voltage Interlock System*
- *ICE – Internal Combustion Engine*
- *LV – Low Voltage*
- *MSD – Manual Service Disconnect*
- *PPE – Personal Protection Equipment*
- *PTC – PTC (Fluid Heater)*
- *RDM – Rear Drive Module*

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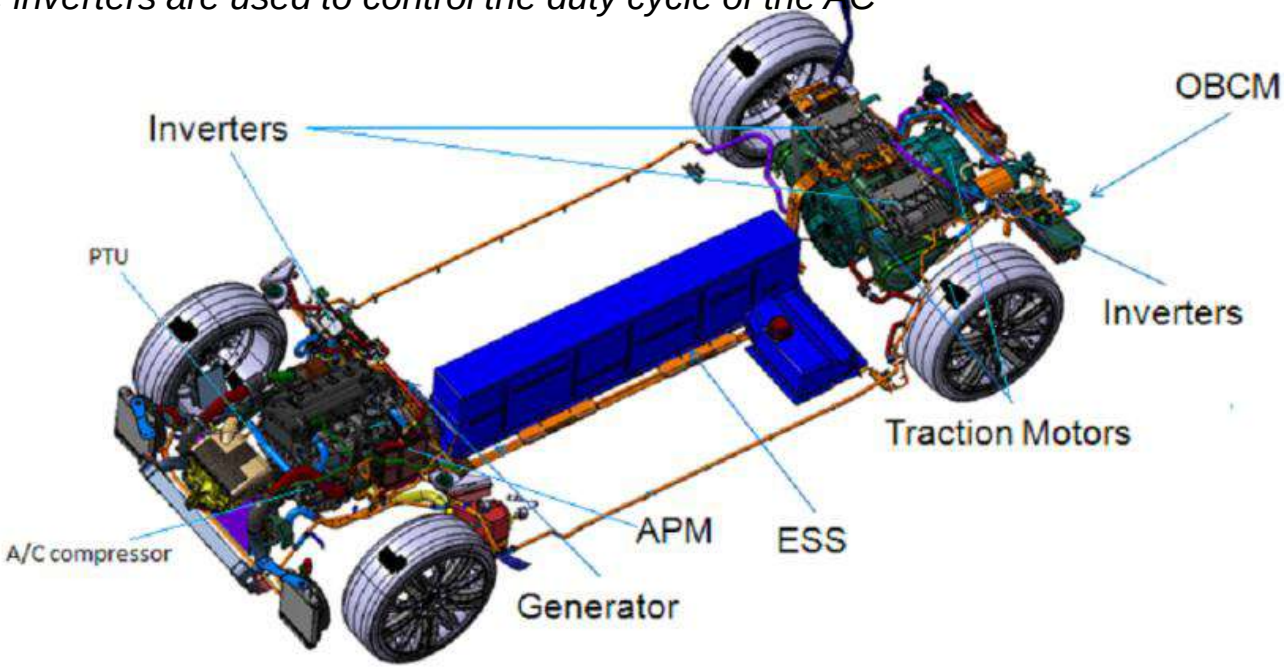
Introduction (Continued)

The energy used to power the Karma is stored in a 400 volt lithium-ion battery mounted along the center of the vehicle which can be accessed from under the vehicle. The Energy Storage System (ESS) battery shares energy with three different inverters:

- *The front inverter sends A/C voltage to the traction motors when the Internal Combustion Engine (ICE) is driving the generator. The front inverter also maintains the ESS voltage level. The front inverter is located on the passenger front-side of the bulkhead.*

- *The trunk area houses two additional inverters that are mounted over the Rear Drive Module (RDM). The inverters change between Direct Current (DC) voltage and Alternating Current (AC) voltage depending on the mode of operation. The inverters are used to control the duty cycle of the AC voltage to the traction motors.*



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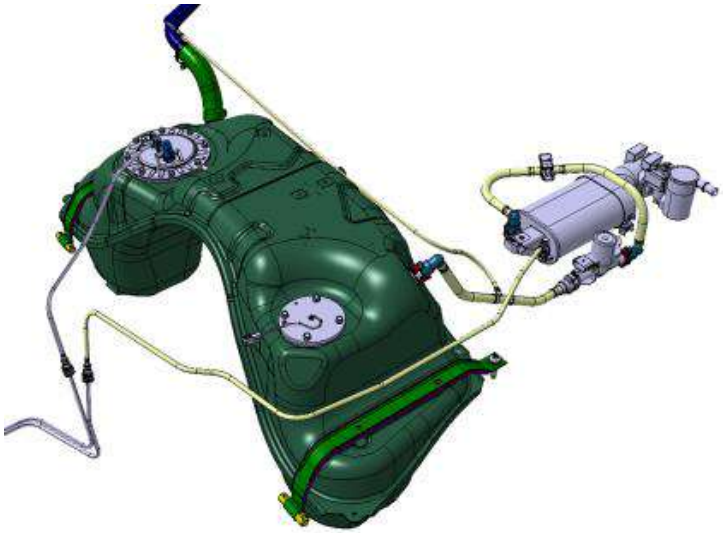
Introduction (Continued)

Gasoline for the Internal Combustion Engine (ICE) is stored in a saddle-type fuel tank mounted above the Rear Drive Module (RDM).

The Fisker Karma has an ICE used only to turn the generator and is not coupled to the wheels.



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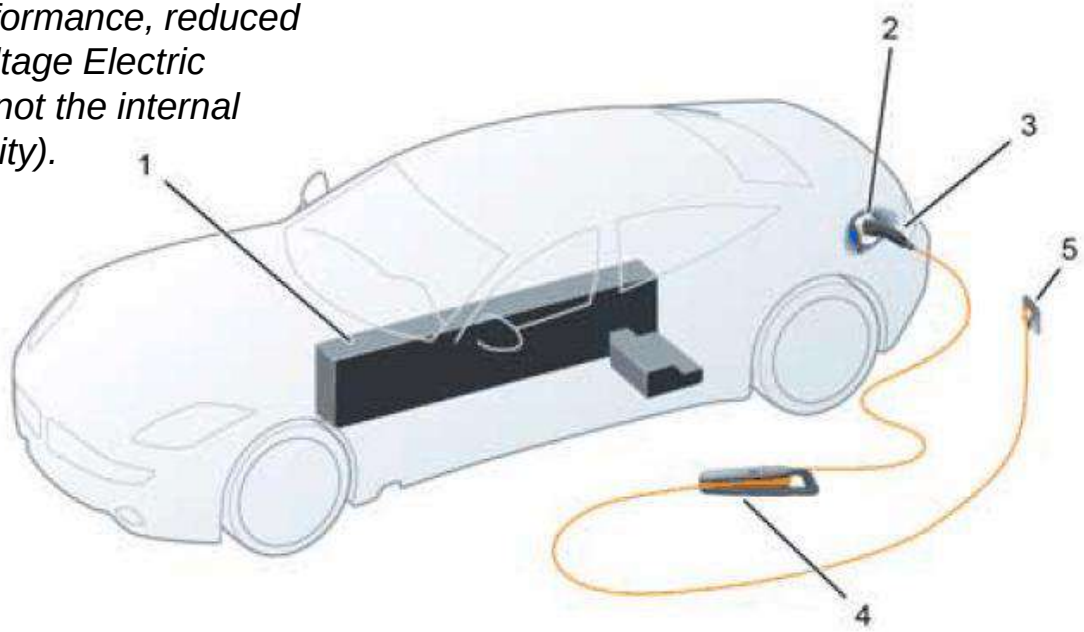
Introduction

This type of series-hybrid is required to be plugged into an 120v or 240v electrical outlet for full recharging of the ESS.

The hybrid combination of a gasoline engine and a generator provide power to two electric traction motors for improved performance, reduced emissions, and improved fuel economy. The High-Voltage Electric system is the driving force behind the powertrain and not the internal combustion engine (which is used to generate electricity).



FOM0154

1. High voltage battery
2. Charging port
3. Charging cord connector
4. Convenience charging cord
5. Electrical outlet

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Introduction (Continued)

The Electric Vehicle extended range (EVer) system incorporates a generator that is driven by the gasoline engine to produce and maintains the high-voltage battery during cruising. The battery also charges during regenerative braking by using the kinetic energy of the traction motors during deceleration and braking.

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SAFETY

This chapter will cover:

- *Safety Overview*
- *High-Voltage Electrical Disconnect Features*
- *Other High-Voltage Electrical Components*
- *Low Voltage Battery*
- *Safety Equipment*

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Safety Overview

The Fisker Hybrid vehicle has been designed with many safety features for your protection. These features help provide safe access to the vehicle.

The Fisker series hybrid vehicles can be easily identified by the Fisker EVer badges located on the left and right front fenders.

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Safety Overview (Continued)

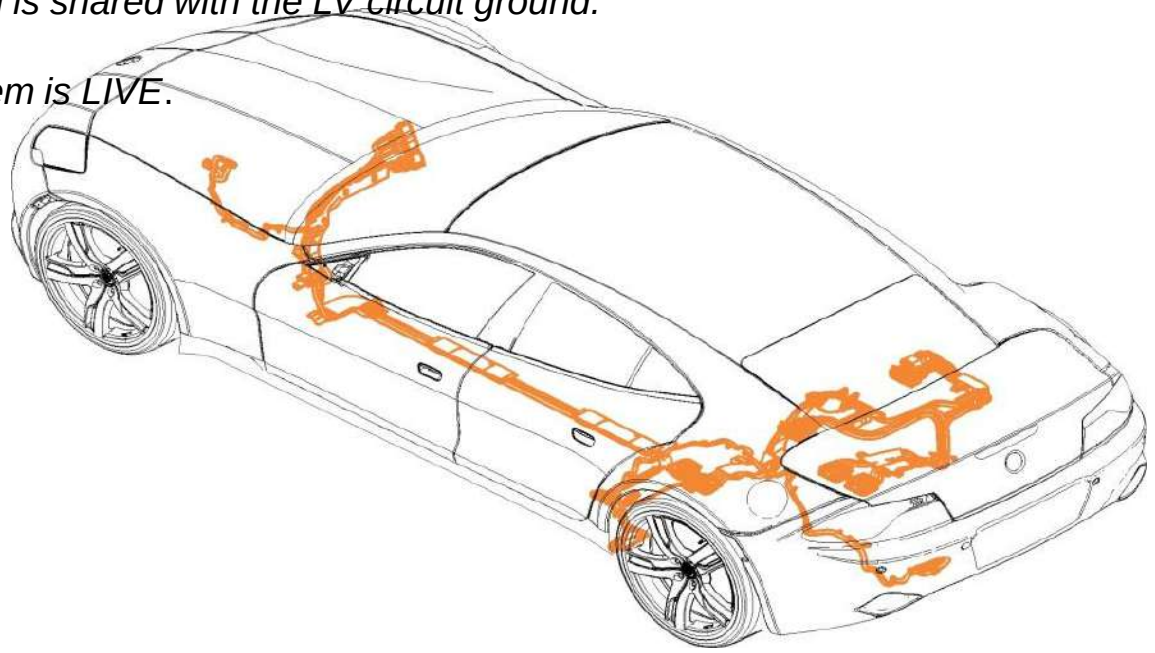
Fisker System is a "Floating" System which means the High Voltage (HV) circuit grounds are separate from the Low Voltage (LV) circuit grounds.

The Energy Storage System (ESS) measures the HV system's "Isolation" from HV Circuits to Chassis Ground.

Faults will be displayed in the Driver Instrument System (DIS) / Cluster.

An electric shock may occur if the HV circuit ground is shared with the LV circuit ground.

***WARNING**: Always assume the High Voltage system is LIVE.*



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High-Voltage Electrical Disconnect Features

The following diagnostic features describe certain elements that have been incorporated into the Hybrid vehicles that allow for either manual or automatic shutoff of the high-voltage electrical system.

The high-voltage system is disabled whenever the high-voltage Manual Service Disconnect (MSD) is removed. The MSD is located behind the back seat on the driver's side of the vehicle under a protective black cover (which is opened by a tethered pin).

***NOTE**: The "In Case Of An Emergency Situation" chapter provides directions to power down the LV and HV systems.*

In the event of a high-current short circuit, a high-voltage fuse in the MSD will open and disable the high-voltage system.

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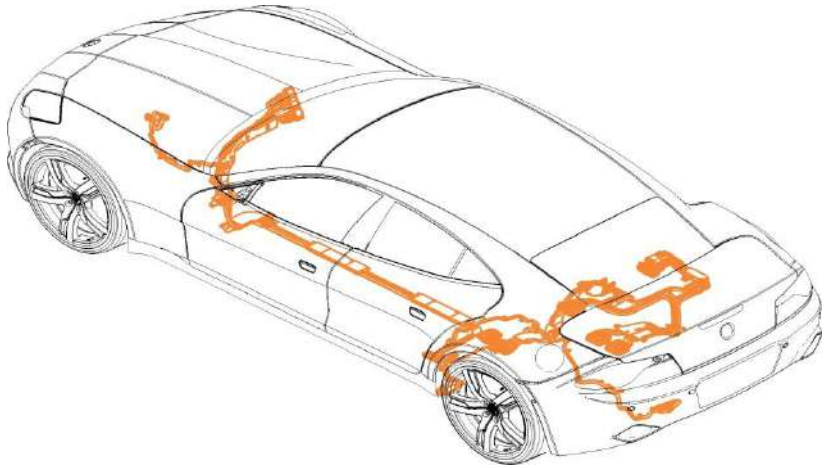
High-Voltage Electrical Disconnect Features (Continued)

The High-Voltage InterLock (HVIL) circuit opens and disables the high-voltage system whenever a high-voltage connector is disconnected.

***NOTE**: All high-voltage wires and harnesses are wrapped in orange-colored insulation and have a High Voltage InterLock connector (except out of the RDM).*

The High Voltage harness travels the length of the vehicle from under the hood at the generator to the front inverter. There are 3 independent HV circuits that run to the Air Conditioning compressor, PTC (Liquid Heater), the Accessory Power Module (APM), the rear inverters, and traction motors.



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High-Voltage Electrical Disconnect Features (Continued)

The Start/Stop Button is located where a typical key-ignition switch is located at the right of the steering column. Anytime the Start/Stop Button is in the OFF function the high-voltage system is disabled.

In the event the Start/Stop Button is in the ready function and the high-voltage battery temperature exceeds 60°C (140°F), the thermal sensors (located internal to the high-voltage battery) will automatically disable the high-voltage battery.

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High-Voltage Electrical Disconnect Features (Continued)

The Accessory Power Module (APM) is a DC/DC Converter. The APM is a High Voltage component located under the hood on the driver's side steps 400 volts down to 13-14 volts of power to operate and the vehicle run vehicle's 12 volt accessories. The APM has an independent high voltage harness from the ESS.

***NOTE**: The emergency cut location is identified by a sticker located off the APM.*

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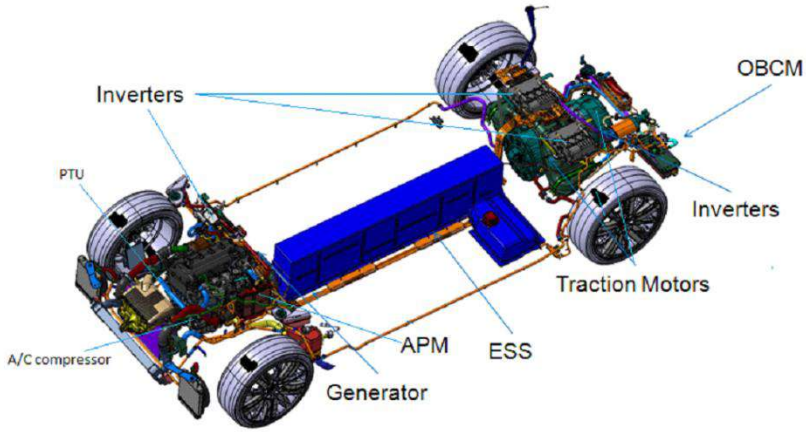
Other High-Voltage Electrical Components

Traction motors provide for vehicle propulsion and generate electricity to re-charge the ESS during regenerative braking. An ICE and generator motor are used (with an inverter) to produce voltage to maintain the charge of the HV battery and power the rear traction motors in sport mode.



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Other High-Voltage Electrical Components (Continued)

The electric Air Conditioning compressor is located on the driver-side of the ICE and replaces the belt driven A/C compressor. The A/C circuit has an independent high voltage harness going to the ESS.

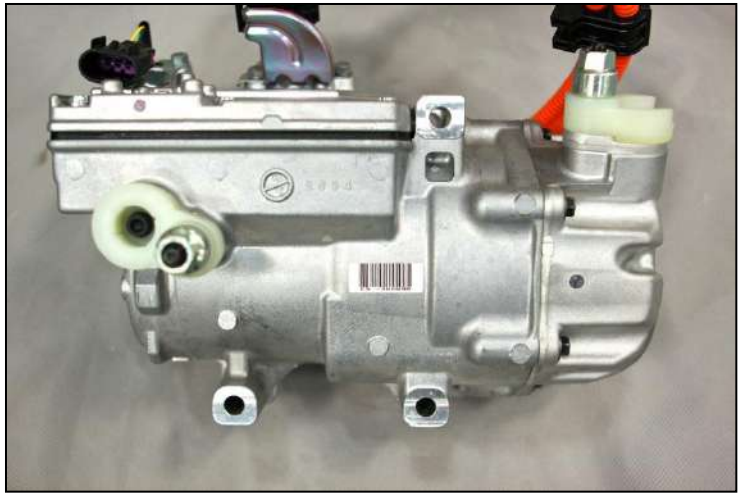
Vehicles may be equipped with 134a refrigerant or 1234yf. Be sure to look at the labels on the vehicle to determine the correct refrigerant and procedure.

***CAUTION**: 1234yf is mildly flammable.*

Follow the Service Information when maintaining the A/C System with 1234yf.

***WARNING**: Read Vehicle refrigerant label prior to De-gas. European vehicle systems are filled with H1234YF and must not be de-gassed using an A/C station designed to recover R134a.*

***WARNING**: Your vehicle is equipped with an air conditioning system that uses R1234yf refrigerant. This type of refrigerant is flammable and a fire or explosion could result if it is exposed to air and an ignition source.*



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Other High-Voltage Electrical Components (Continued)

The PTC Fluid Heater (PTC) is used to heat the coolant that passes to the passenger compartment to maintain the customer's demand for heat with the ICE OFF. The PTC has an independent high voltage loop from the ESS.

The PTC Fluid Heater is located under the coolant reservoir.

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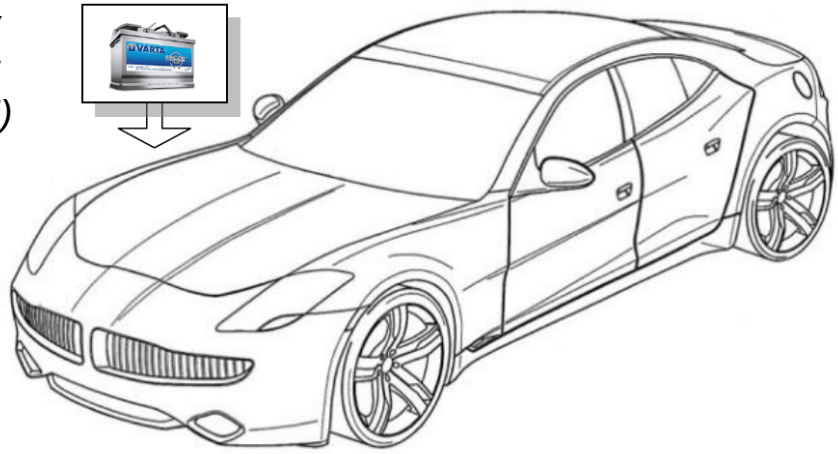
Low-Voltage Battery

The hybrid has a 12-Volt Maintenance Free Battery which is located in the inner passenger front fender behind the wheel. The Absorbent Glass-Mat (AGM) battery stores 12-volt power for the vehicle's low voltage system.



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Safety Equipment

The following Personal Protection Equipment (PPE) should be available when around a high-voltage system:

- *High-Voltage Insulated Glasses*
- *High-Voltage Outer Gloves*
- *Insulating Covers*
- *Insulating Bags*
- *Face shields*
- *Insulating Bags*
- *High-Voltage Rescue Hook (Safety Pole)*

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GENERAL CAUTIONS, WARNINGS, & HAZARDS

This chapter will cover:

- *Warning Labels*
- *High-Voltage Battery Pack Warnings*
- *Arc Flash Hazards*

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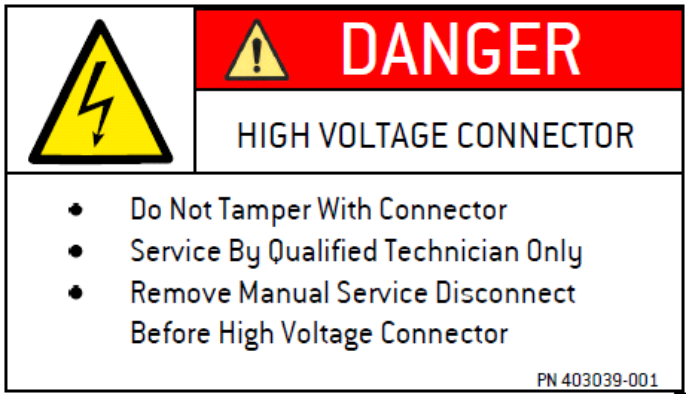
Warning Labels

The Fisker Hybrid has been designed with the maximum in driver and technician safety in mind. The vehicle has High Voltage (HV) warning labels and there are several devices that are designed into the hybrid system of the vehicle to minimize any danger from electrical shock.

However, in order to ensure your safety whenever working around the EVer hybrid powertrain there are critical steps that must be performed when servicing or working around the High Voltage (HV) system.



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High-Voltage Battery Pack Warnings

Removing the high-voltage MSD will disconnect the high-voltage from the vehicle.

***WARNING**: The vehicle must be turned off before removing the MSD. Refer to the "In Case Of An Emergency Situation" chapter of this course for details on powering down the system.*

The individual cells inside the battery pack will still be charged even though the MSD has been removed.

Do not cut, weld, or screw into the high-voltage battery case or penetrate the batteries in any way.

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High-Voltage Battery Pack Warnings (Continued)

The high-voltage battery pack MSD is located under the left rear seat cushion.

The total voltage of the Energy Storage System battery pack is approximately 400 volts DC.

The battery case is designed to be water resistant.

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High-Voltage Battery Pack Warnings (Continued)

The ESS has 15 individual battery packs. Each battery pack contains 21 battery cells. The battery cells contain lithium.

Lithium batteries may produce sparks or explode if punctured. Care must be taken when handling or using fork lift equipment to unload. Do not allow to drop from any lifting equipment.

Lithium-ion batteries contain high-performance Nanophosphate® technology.

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High-Voltage Battery Pack Warnings (Continued)

Incorrectly carrying out repair procedures may result in injury or death.

Never enter a compromised area alone (i.e. Vehicle or Lab w/ Burning or Arcing Equipment).

Do not wear jewelry or metal objects around High Voltage circuits (such as):

- *Rings*
- *Metal Watches*
- *Exposed Necklaces*
- *Badges with Neck straps*

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Arc Flash Hazards

An arc flash occurs when electrical current passes through the air. Arc Flash most often occurs when a live High Voltage circuit is unplugged without properly depowering the 12 volt system before removing the MSD.

Do not unplug (or plug in) any of the Orange connectors with the MSD connected LIVE to the High Voltage system. Heat generated by an Arc Flash can reach temperatures as high as 36,000ºF (5 times the temperature of the sun).

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Arc Flash Hazards (Continued)

Approximately 80% of all injuries and fatalities caused by electrical incidents are not caused by electric shock but by the intense heat, light, and pressure wave (blast) caused by electrical faults.

The arc flash in an electrical fault produces the same type of light radiation from which electric welders protect themselves using face shields with dark glass, heavy leather gloves, and full-coverage clothing.

The heat produced may cause severe burns, especially on unprotected flesh. An ARC BLAST is produced by vaporizing metallic components can break bones and irreparably damage internal organs.

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Arc Flash Hazards (Continued)

The degree of hazard present at a particular location can be determined by a detailed analysis of the electrical system and appropriate protection worn if the electrical work must be performed with the electricity ON.

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IN CASE OF AN EMERGENCY SITUATION

This chapter will cover:

- *What To Do*
- *Approaching A Damaged Vehicle*
- *Approaching A Damaged Battery*
- *Steps to Discharge Low & High Voltage Systems*
- *High Voltage Battery Disposal*
- *Towing Guidelines*

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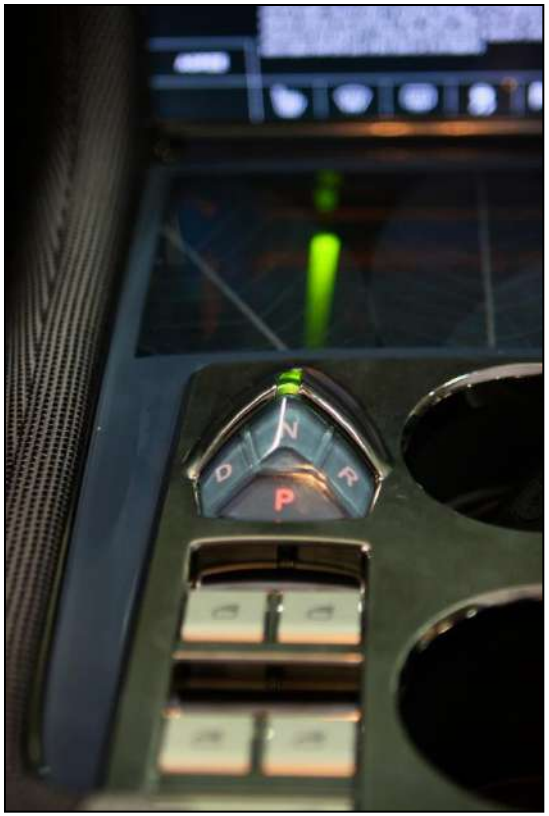
What To Do

In the event of an emergency, the first step is to create a safer environment.

1. *Attempt to put the vehicle in park. Press "P" on the Driver Selector Unit on the center console.*
2. *Attempt to turn OFF the Start/Stop Button. Press 3x for an emergency shut off if the vehicle will not turn off on a single push.*
3. *Set the park brake button located at the lower left-side of the steering column.*
4. *Exit the vehicle safely.*
5. *Contact first responder personnel. Advise them that the vehicle is a Hybrid Electric Vehicle.*



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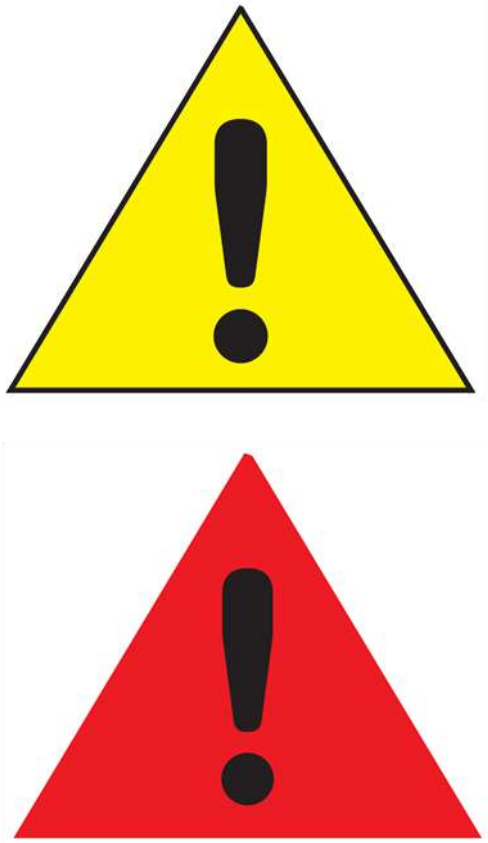
Approaching A Damaged Vehicle

Remove all jewelry (watches, necklaces, and earrings). Metal objects are conductors of electricity.

Use a non-conductive object (about 1.5 m or 5 ft. long) to safely push someone away from the vehicle if they accidentally come in contact with high-voltage.

If the vehicle has any exposed cables, make sure to wear high-voltage rubber gloves and other protective clothing. Do not touch any broken or damaged high-voltage orange cables. Treat severed cables as if they contain high voltage.



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Approaching A Damaged Vehicle (Continued)

All employees should know how the location of the fire alarm, fire extinguisher, and know how to contact the fire department.

If the vehicle is experiencing a thermal event, use a Class ABC powder-type extinguisher to contain and smother the flames sweeping from the bottom to the top of the flames.

***WARNING**: If the Lithium Battery is Punctured, do NOT use water on the battery. However, if water must be used, LARGE amounts of water will be required (e.g., from a fire hydrant) to extinguish the flames.*

Class A	TYPICAL FIRE – Wood, Paper, Cloth, Rubber, and most Plastics
Class B	CHEMICAL FIRE – Flammable Liquids, Gasoline, Kerosene, Oil, Grease, Gases, and Solvents
Class C	ELECTRICAL FIRE – Live Electrical Equipment and Wiring

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Approaching A Damaged Vehicle (Continued)

If the vehicle is submerged in water, do not touch any high-voltage components or orange cables while extricating the occupant(s).

Do not remove the vehicle until you are sure the high voltage battery is completely discharged. A submerged high-voltage battery may produce a fizzing or bubbling reaction. The high-voltage battery will be discharged when the fizzing or bubbling has completely stopped.

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Approaching A Damaged Battery

Exposure to electrolyte could cause skin/eye irritation and/or burns. If exposed, rinse with large amounts of water until the soapy feel is gone.

Personal Protective Equipment (PPE) such as splash shield or safety goggles, gloves (latex, rubber, or Nitrile) are required when handling damaged batteries.

Insure the area is properly ventilated, such as, opening the vehicle windows or doors.

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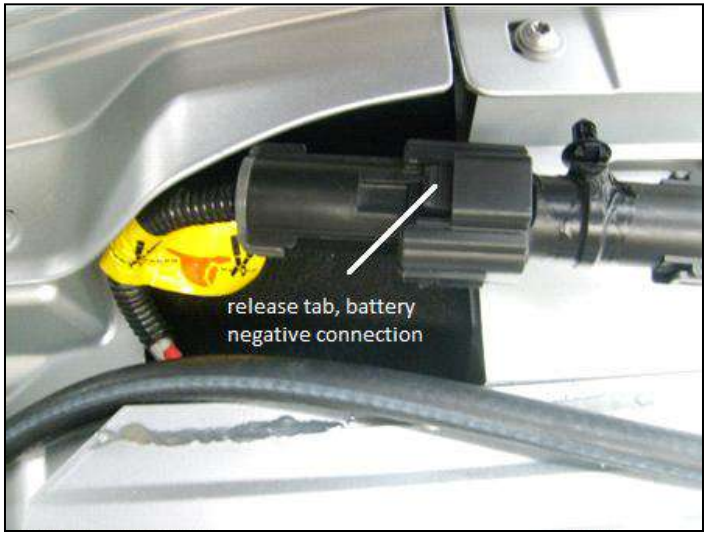
Steps To Discharge The Low & High Voltage Systems

Follow these steps to discharge the Low Voltage & High Voltage systems:

1. *Secure the vehicle — place the Driver Selector Unit (PRND) switch into the PARK position.*
2. *Turn off the powertrain by depressing the brake and the Start/Stop Button. If the vehicle will NOT turn off, then press the Start/Stop Button 3 TIMES rapidly to force the vehicle to power down.*
3. *Disconnect the negative cable from the 12-volt battery which will disable the high-voltage system.*

***NOTE**: Using the Start/Stop Button and /or MSD to power down the HV System will take about 5 minutes for a complete system discharge.*

Residual voltage will be present in the High-Voltage circuit due to the energy stored within the capacitors (in the inverters) and the windings (in the traction motors).



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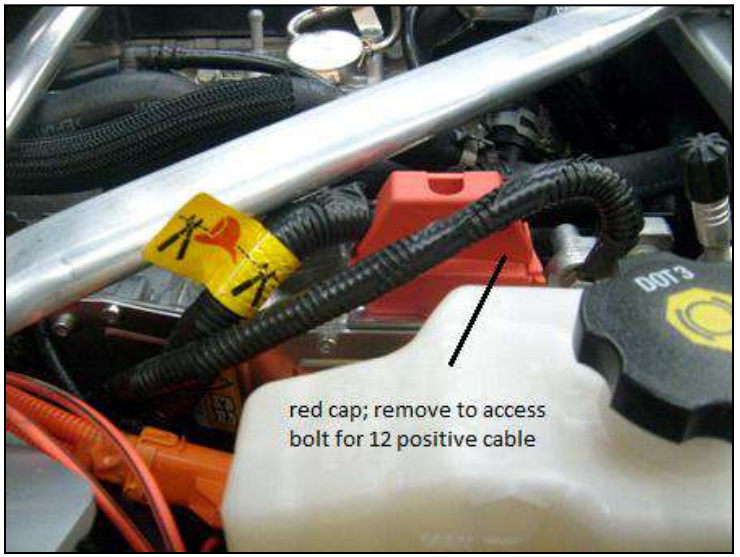
Steps To Discharge The Low & High Voltage Systems (Continued)

In an emergency situation, cut the power cable by the APM which is identified with an emergency cut sticker.

Cutting the APM Cable is NOT necessary for normal vehicle service unless 13+ volts is detected at the APM with the vehicle Start/Stop Button in the OFF position; and the negative battery cable disconnected.



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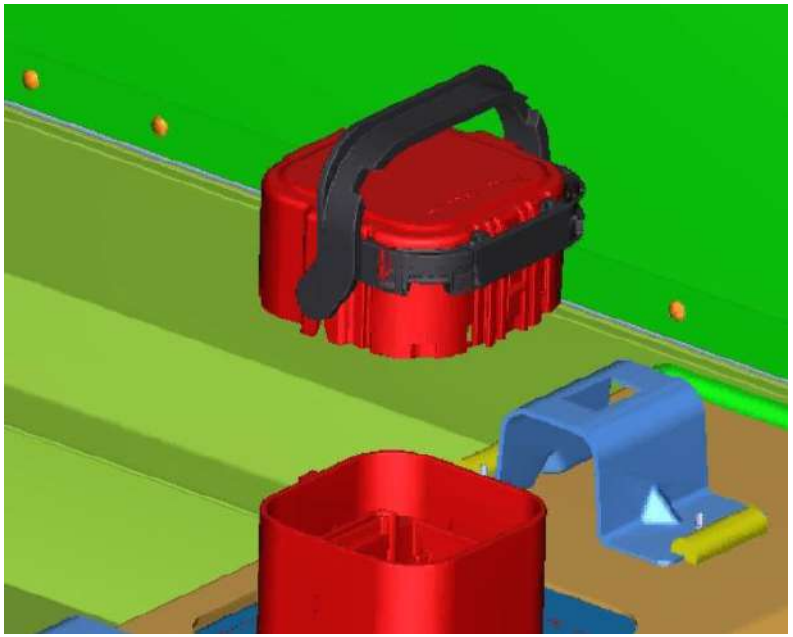
Steps To Discharge The Low & High Voltage Systems (Continued)

WARNING: *The system should ALWAYS be powered down before the MSD is removed. The MSD should NEVER be used to shut down the system before first powering down the 12 volt system.*

- *Access and remove the Manual Service Disconnect located **under the driver-side rear seat**. The seat is secured with tabs that will release when the seat is lifted upwards, no tools are needed.*
- *Open the access cover by sliding out the locking pin.*
- *Press the tab and lift the first handle.*
- *Press the tab again and lift the second handle. The MSD will rise slightly.*
- *Make sure the first handle is in the vertical position before attempting to remove the MSD.*
- *Pull the MSD completely off and store while work is being performed.*



NOTE: *You must wait a minimum of 5 minutes for the HV System to discharge before working on the vehicle.*

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High-Voltage Battery Disposal

If a vehicle with a high-voltage battery is to be scrapped, the high-voltage battery must be disposed of following all local, state/provincial, and federal guidelines.

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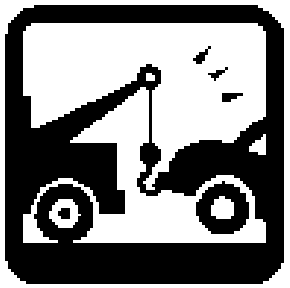
Towing Guidelines

The vehicle can only be towed on a Flat Bed.

⚠ ***CAUTION**: Towing the vehicle with the wheels on the ground or on a suspended lift, may cause serious damage to the vehicle as well as generating high voltages in the vehicle's electrical components.*

***NOTE**: Damage caused by any other recovery method will not be covered by the vehicle warranty.*



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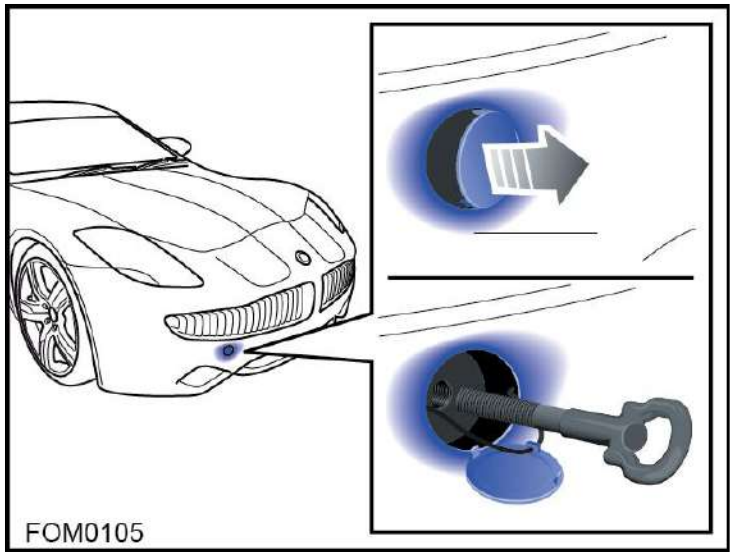
Towing Guidelines (Continued)

A vehicle recovery eye can be attached to the front of the vehicle to allow the vehicle to be pulled onto a transporter in situations when the vehicle cannot roll freely.

***CAUTION**: Under no circumstances should the vehicle be towed using the vehicle recovery eye. Doing so can cause significant damage to your vehicle.*

The recovery eye is located in the under-floor storage area of the trunk.

- *Using a flat bladed screwdriver, remove the cover in the front bumper.*
- *Locate the recover eye through the bumper and screw the recovery eye into its fixing until secure.*



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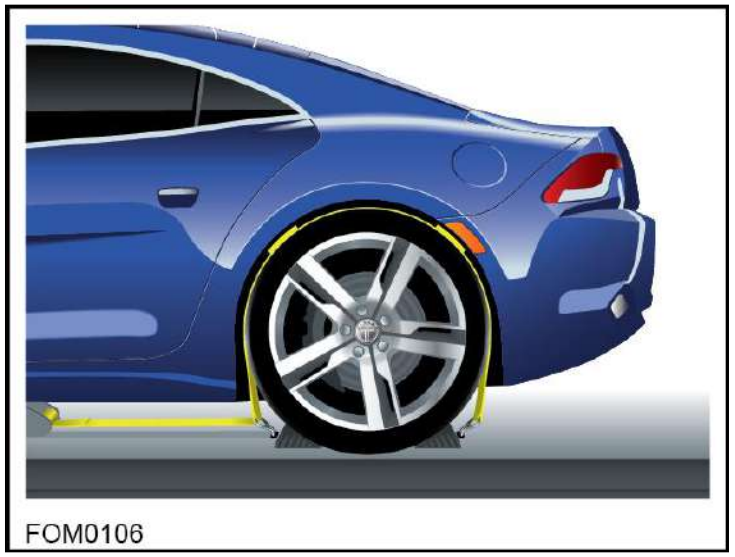
Towing Guidelines (Continued)

When the vehicle is in position on the transporter or trailer, use chocks and tie down straps to secure the wheels.

To avoid damage:

- *Ensure that metal parts on tie down straps do not contact the vehicle's painted surfaces or the face of any wheels.*
- *Do not place straps over or through the vehicle's body panels.*

***CAUTION**: Attaching straps to the chassis, suspension, or other parts of the body can damage the vehicle.*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FIRST AID

This chapter will cover:

- *Overview*
- *Symptoms*
- *Conditions for Medical Care*

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Overview

An electric shock occurs when a person comes into contact with an electrical energy source. Electrical energy flows through a portion of the body causing a shock.

Exposure to electrical energy may result in no injury at all or may result in devastating damage or death. Burns are the most common injury from electric shock.

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Symptoms

A person who has suffered an electric shock may have very little external evidence of injury or may have obvious severe burns. The person could even be in cardiac arrest.

Burns are usually most severe at the points of contact with the electrical source and the ground. The hands, heels, and head are common points of contact.

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Symptoms (Continued)

Other injuries are possible if the person has been thrown clear of the electrical source by forceful muscular contraction. Consideration should be given to the possibility of a spine injury. The person may have internal injuries especially if he or she is experiencing any shortness of breath, chest pain, or abdominal pain.

Pain in a hand, foot, or a deformity of a part of the body may indicate a possible broken bone resulting from the electric shock.

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Conditions For Medical Care

Following a Low-Voltage shock, call the doctor for the following reasons:

- *If it has been more than 5 years since your last tetanus booster*
- *Burns that are not healing well*
- *Burns with increasing redness, soreness, or drainage*
- *Any electric shock in a pregnant woman*

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Conditions For Medical Care (Continued)

A person shocked by High-Voltage should be evaluated in the Emergency Department. It may be prudent to get pre-hospital care, usually obtained by calling 911.

Go to the Emergency Department for the following concerns:

- *Any noticeable burn to the skin*
- *Any period of unconsciousness*
- *Any numbness, tingling, paralysis, vision, hearing, or speech problems*
- *Any electric shock if more than 20 weeks' pregnant*
- *Any other worrisome symptoms*

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Conditions For Medical Care (Continued)

Inhalation: *If contents of an opened cell are inhaled, remove source of contamination or move victim to fresh air. Obtain medical advice.*

Eye Contact: *Contact with the contents of an opened cell can cause burns. If eye contact with contents of an open cell occurs, immediately flush the contaminated eye(s) with lukewarm, gently flowing water for at least 30 minutes while holding the eyelids open.*

Neutral saline solution may be used as soon as it is available. If necessary, continue flushing during transport to emergency care facility. Take care not to rinse contaminated water into the unaffected eye or onto face.

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Conditions For Medical Care (Continued)

Skin Contact: *Contact with the contents of an opened cell can cause burns. If skin contact with contents of an open cell occurs, remove (as quickly as possible) all contaminated clothing, shoes, and leather goods. Immediately flush with lukewarm, gently flowing water for at least 30 minutes. If irritation or pain persists, seek medical attention.*

Clothing*: Completely decontaminate clothing, shoes, and leather goods before reuse or discard.*

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Conditions For Medical Care (Continued)

Ingestion: *Contact with the contents of an opened cell can cause burns. If ingestion of contents of an open cell occurs, NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing.*

Have victim rinse mouth thoroughly with water.

WARNING: DO NOT INDUCE VOMITING - *If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Have victim rinse mouth with water again. Quickly transport victim to an emergency care facility.*

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SERVICING

This chapter will cover:

- *Safety Equipment*
- *Testing Equipment*
- *Work Practices*

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Safety Equipment

The following Personal Protection Equipment (PPE) should be available when servicing the hybrid vehicle:

- *High-Voltage Insulated Glasses*
- *High-Voltage Outer Gloves*
- *Insulating Covers*
- *Insulating Bags*
- *Face shields*
- *Insulated Tools*
- *High-Voltage Rescue Hook (Safety Pole)*

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Safety Equipment (Continued)

PPE must be maintained in a safe, reliable condition, and be inspected for damage before each day's use. Immediately inspect the PPE following any incident that can reasonably be suspected of having caused damage to the equipment.

Insulating gloves shall be visually inspected before each use, electrically re-tested in accordance with ASTM standards (every six (6) months for gloves and sleeves. Gloves shall be marked with either the date tested or with the date the next test is due.

Whenever rubber gloves are used, they must be protected by outer canvas or leather gloves. Insulating protective equipment found to be defective or damaged must be immediately removed from use.

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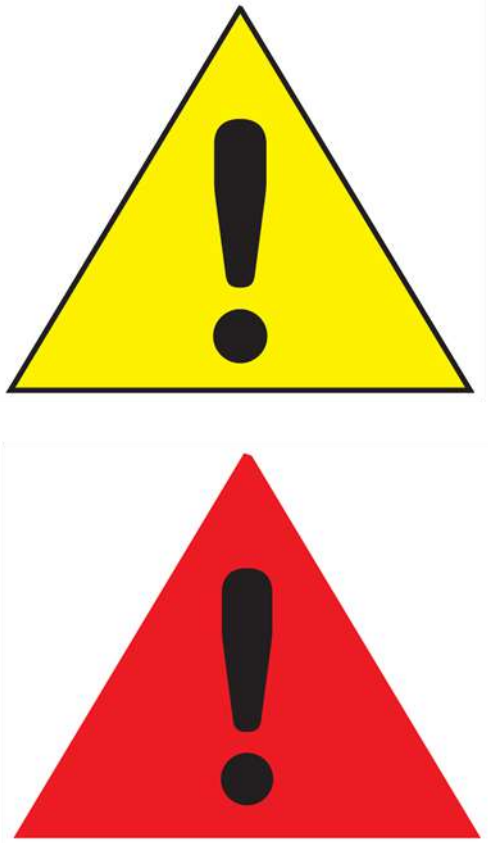
Safety Equipment (Continued)

Technicians working in areas where there are potential electrical hazards must be provided with and use personal protective equipment (PPE) that is appropriate for the specific work to be performed.

The electrical tools and protective equipment must be specifically approved, rated, and tested for the levels of voltage of which an employee may be exposed.



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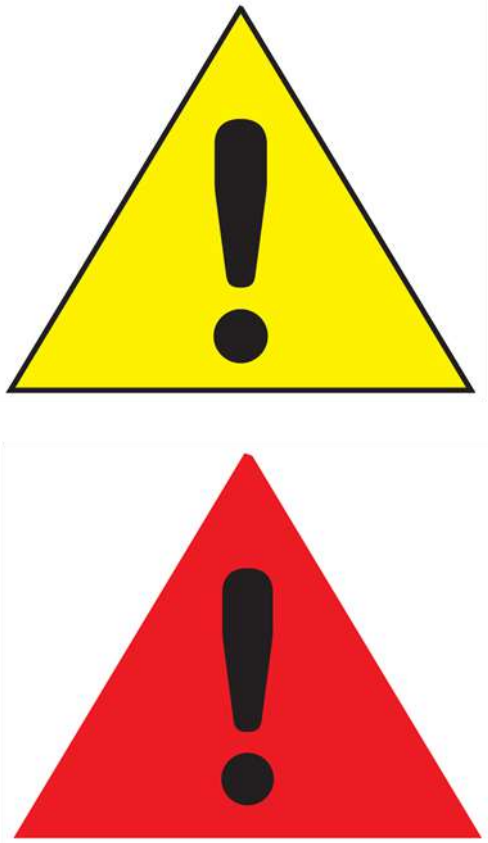
Safety Equipment (Continued)

Fuse handling equipment (insulated for circuit voltage) must be used to remove or install fuses when the fuse terminals are energized. Ropes and hand lines used near exposed energized parts must be non-conductive.

Protective shields, barriers, or insulating materials must be used to protect each employee from shock, burns, or other electrical injuries while that person is working near exposed energized parts that might be accidentally contacted or where dangerous electric heating or arcing might occur.

Employees must wear protective equipment for the eyes or face wherever there is a potential danger of electric arcs, flashes, or flying objects resulting from electric explosion. This should include polycarbonate safety glasses with side shields and a full-face shield.



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Testing Equipment

All electrical test equipment must be inspected for damage before use. The equipment must not be used if it is damaged or if its functionality is questionable.

Equipment must be handled in a manner that will not damage the equipment. Prior to each use, electrical test equipment, such as voltmeters, must be verified to be functional. This is accomplished by testing the voltmeter on a known voltage to verify correct readings.

After metering or testing is completed, the voltmeter should again be tested on a known voltage to verify functionality of the voltmeter.

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Testing Equipment (Continued)

Always Measure the HV circuit to assure that it is de-energized. Check for voltage present at the APM after a 12 volt negative cable disconnect. Use an appropriate DVOM to check for voltage at the cable connection under the red cap on the APM.

If 13+ volts is present at the APM after the negative battery cable disconnect, then the contactors in the ESS may be engaged and the HV circuit is live. Carefully remove the MSD using the appropriate PPE and call Fisker technical support.

⚠ ***WARNING**: Always assume the HV circuit is LIVE.*

Capacitors on HV DC circuit can maintain HV for a short period after the Start/Stop Button is OFF or the Manual Service Disconnect (MSD) is removed.

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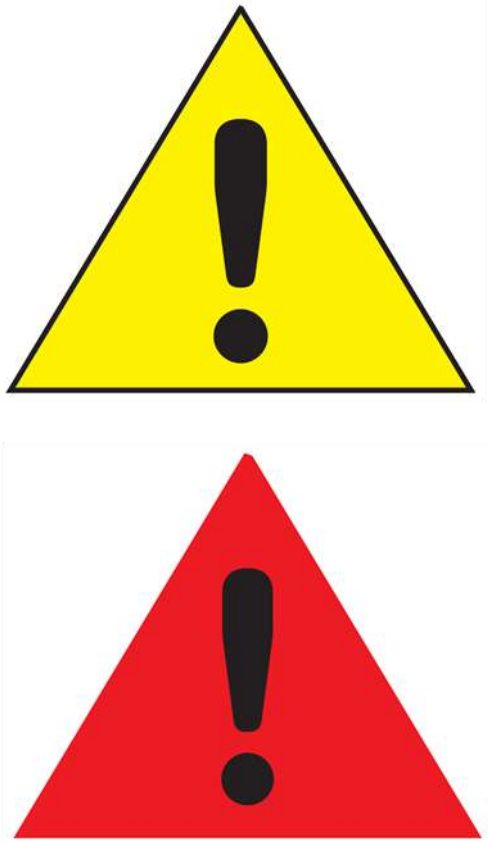
Work Practices

Keep covers over live electrical contact points.

Verify the voltages present when working near live electrical contact points.

The area in the immediate vicinity of the workspace must be surveyed and all potential hazards such as ladders, stacked boxes, or doors that may swing into the workspace must be secured to prevent interference with the work being performed. Be mindful of unsafe working conditions such as poor lighting, flammable liquids, or flammable gases.

A clear escape path must be maintained from the work space to an exit from the area.



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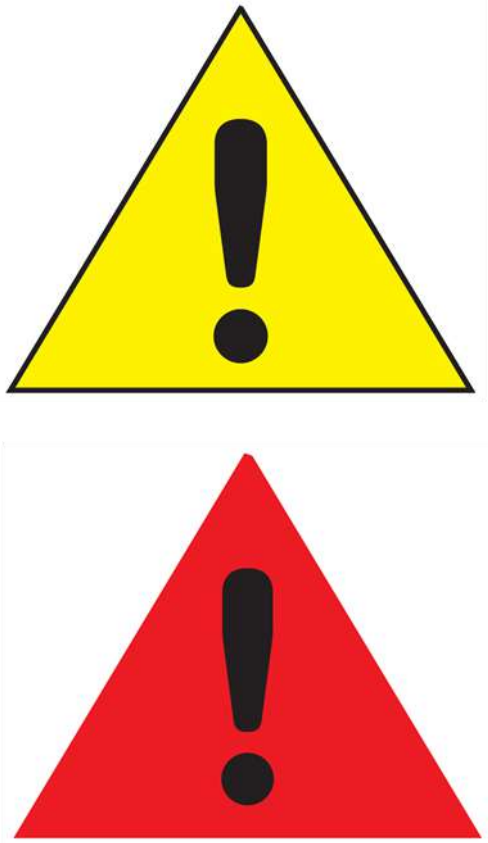
Work Practices (Continued)

Minimize hazardous locations – keep the area in which airborne flammable dust, vapors, or gas may be present and would represent a hazard if a source of ignition were present.

Verify there are no metal shavings present around HV connections.

Workers performing unsafe acts – do not sneak up and attempt to startle a co-worker when working in a High Voltage safety zone.



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Work Practices (Continued)

Do not wear loose fitting or conductive apparel such as rings, watches, bracelets, necklaces when working on or near High Voltage components.

Inspect your work area, set up safety cones and a hybrid safety Zone approximately 3 feet around the vehicle. The safety zone should be marked with orange cones before High Voltage service is started.

***NOTE**: Only Fisker Certified technicians are permitted around the vehicle when it is in for service/maintenance.*

Fisker Automotive, the importers, and the service technicians are not responsible for the liability and insurance concerns of the workers. It is the dealership's managing director (or assigned manager) who is assigned to safety related obligations, liability, and insurance concerns at the facility.

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Work Practices (Continued)

Never work alone on high voltage systems. A co-worker should be in the area.

Perform a though visual inspection, check for damaged wiring any exposed copper, pinched harness, cuts or missing insulation, damaged or cracked connectors.

Know where the fire extinguishers, eye wash equipment, or portable defibrillator equipment are located on site

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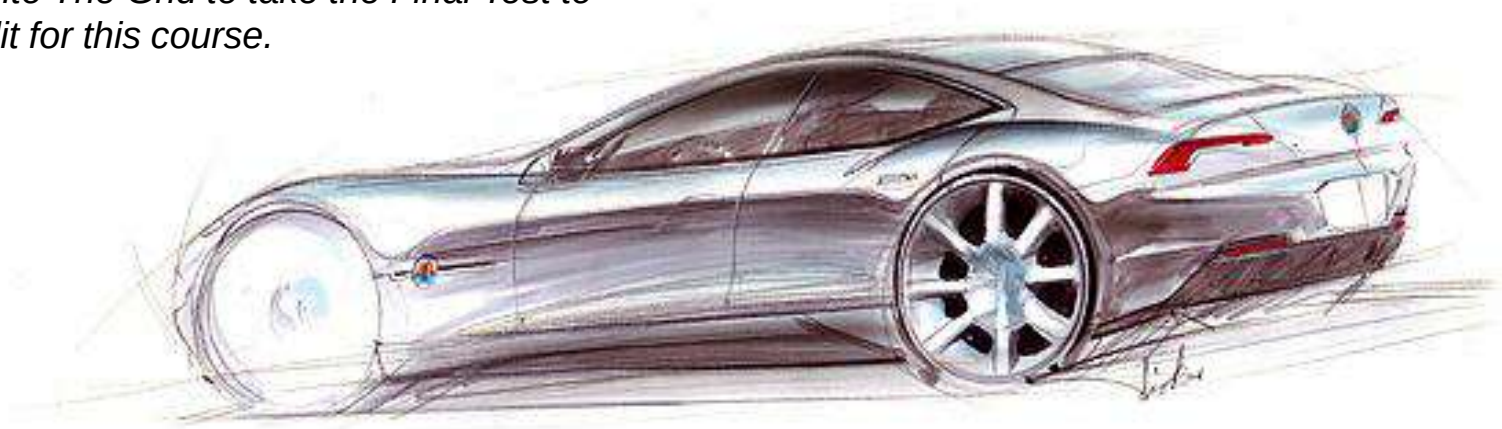
CONCLUSION

Thank you for participating in the Fisker High-Voltage Safety Course.

The following topics were covered:

- *Introduction*
- *Safety*
- *General Cautions & Warnings*
- *In Case Of An Emergency Situation*
- *First Aid*
- *Servicing*

Please log into The Grid to take the Final Test to receive credit for this course.



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